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XVII
**EXPEDITION OF THE CALIFORNIA ACADEMY
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CALIFORNIA IN 1921¹**

NEW AND LITTLE KNOWN PSEUDOSCORPIONS,
PRINCIPALLY FROM THE ISLANDS AND
ADJACENT SHORES OF THE GULF
OF CALIFORNIA

BY

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The specimens upon which this paper is based were collected principally by the author, while a member of the California Academy of Sciences Expedition to the Gulf of California during the spring and summer of 1921. Many interesting species were collected, the majority of which are new. Among the most interesting of the new species is one which represents a new genus *Sternophorus* which falls in a new subfamily, *Sternophorinae*. Several others such as *Garypinus* and *Minniza* represent genera which are new to North America.

I wish to thank Dr. Barton Warren Evermann and Mr. E. P. Van Duzee of the Academy for the privilege of working up this interesting collection. I also desire to extend my sincerest thanks to Prof. G. F. Ferris of Stanford Univer-

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

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sity for much kind and helpful criticism and for many valuable suggestions. My grateful acknowledgments are also due Dr. R. V. Chamberlin of the Museum of Comparative Zoology at Cambridge, Massachusetts, for aid with the literature and for the privilege of examining certain types belonging to that institution.

As I have in preparation a monograph of the North American Pseudoscorpions, I have made some of the descriptions somewhat briefer than I should otherwise have done. I believe, however, that the majority of points of systematic value are included, and in many cases the more important characters are figured.

As I am working with material prepared by a special technique I believe it desirable to give a brief account of the process. Essentially it is the same as is universally used in the making of the better preparations of the Coccidæ or scale insects. It consists primarily of softening the body contents in caustic potash (KOH) and, after their removal, in staining and mounting the animal in Canada balsam. (For details of the method see: Ferris 1918 pp. 8-10). Owing to size and convexity of the palpi and carapace it is necessary in most cases to dissect off a fore and hind leg and often one of the chelicerae, which are then mounted separately or upon the end of the same slide upon which the rest of the animal is mounted. Such characters as are apt to be damaged or lost in the preparation may easily be noted beforehand, i. e. the structure of the galea and the color. I have consistently ignored the color in the preparation of this paper. There is such a wide variation due to such causes as the time elapsed since the last moult, the age, etc., that I believe this character to be almost entirely worthless, the more so since the group as a whole is remarkably uniform in coloration. The types and some of the paratypes of most of the species dealt with in this paper are prepared in this way. The importance of a partial dissection and clearing in KOH of a specimen for really careful study cannot be overestimated. With, who has done the most thorough and critical work that has ever been published on this group, also states that to get the best results it is necessary partially to dissect the specimens. (With, 1906, p. 58 and 1908, pp. 219-220.)

In connection with a number of the species figures are given of the male genitalia. As the relationships of the various parts of the genitalia are not, as yet, thoroughly worked out, allowance must be made in comparing specimens with the figures, not only for distortion in the specimen in hand but also for the distortions inevitably resulting from the mounting process and which are undoubtedly incorporated to some extent in the figures. Particular care must be taken not to pay undue attention to variations in the proportions and shapes, and even to a certain extent to the degree of chitination, of many of the chitinous structures. Taken as a whole they have a very characteristic and fairly constant general appearance and will undoubtedly be found to be of very considerable taxonomic importance. It seems that in some, if not all, cases the genitalia will be of more value in defining genera than species. There is apparently an exception to this in the genus *Garypinus* where, as will be seen by comparing the figures (Plate I, figs. 1-4), there are well defined differences among the species.

Since there has been some confusion and but little uniformity in the morphological terms used within this order, it is desirable to define some of these as employed herein. The following terms are used exactly as defined by With (1906, pp. 12-25, 34-46 and 1908, pp. 219-220), galea, serrula exterior, serrula interior, lateral subterminal setæ, accessory teeth, and tarsal tactile hairs of third and fourth legs. Instead of "cephalothorax" for the dorsal shield of the cephalothorax, the more accurate term, carapace, is used. The *chelicerae* are the *antennæ* of With. In referring to the legs, the femoral articulation is the suture or joint which divides the femur into two subsegments. This division is the rule so far as the Pseudoscorpionida are concerned, the absence of this feature being exceptional. Femur pars basalis and pars tibialis, respectively, are used in referring to the basal and distal parts of the femur. (For a thorough discussion of the femur, see With, 1906, pp. 35-41.) In many cases the femoral parts form perfectly distinct and movable segments and again they are separated by only a narrow suture, in which case the basal part has often been referred to as the *trochantin*. In referring to the abdominal

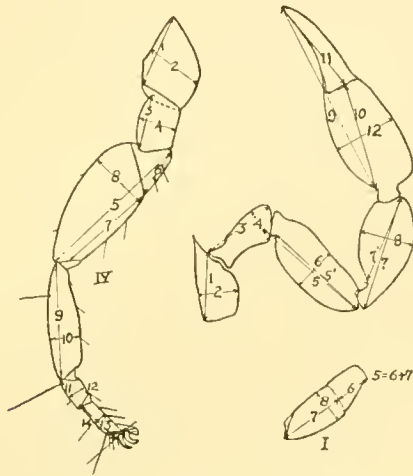
segments, tergites and sternites are used in preference to the usual cumbersome terms of dorsal and ventral scutæ. The *tergal hooks* of the males of the genus *Chelifer* are the modified, posteriorly prolonged and crested distal edges of the tergites.

Measurements are given of the individual segments of legs I and IV and the palpi, and also the length and greatest breadth of the carapace. All these measurements are strictly comparative, the actual dimensions of the parts themselves being rather too variable to be of value. In order to give an idea of the actual size of the arachnid the total length, exclusive of the chelicerae is given in millimeters. Since the entire value of measurements lies in their strict comparability it is important that measurements for comparison with the ones given herein, be taken in the same way. The method and "key" points used in making measurements for this paper are easily seen from the figure (text fig. 1). In the measurements of the carapace the median length and greatest width are given. The measurements of each individual segment are enclosed in parentheses and in all cases length precedes breadth. Appendages are always measured in the following order, coxa, trochanter, femur, tibia and tarsus. When the femoral parts are movably articulated the dimensions of the individual parts are given instead of the dimensions of the femur as a whole, but they are still kept within the same parenthesis. In case the articulation is immovable or nearly so, and also in the case of the claw of the palpus, the total length is given first, then the length of the basal division (hand of claw), then the distal division (fingers of claw) and finally the greatest width. In case of two segmented tarsi, each individual segment is considered separately but both sets of measurements are kept within the same parenthesis, as in the femur. A single figure indicates length only. In the case of the genus *Chelanops* a supplementary measurement is given of the length of the femur and tibia exclusive of the pedicel as shown in text fig. 1.

Finally, these measurements, while always directly and actually comparable within the genus, are not necessarily so when comparison is made between different genera. Also allowance must be made for considerable observational

error, particularly in measurements of the coxæ and trochanters and tarsi, of small species especially. Lengths (except that of fingers and hand) are in all cases more reliable than widths.

Localities, other than type localities, are tabulated at the end of the paper.



EXPLANATION OF FIGURES

I—Femur of leg I showing method of measuring when femoral articulation is vertical; the coxa of leg I is measured as that of the palpus. IV—Leg IV showing system of leg measurement. Palpus showing method of measuring; 5' and 7' show method of making measurement of femur and tibia without the pedicel as used in *Chelanops*; the proportions of the palpus in all cases are: (1-2), (3-4), (5(5')-6), (7(7')-8), (9-10-11, 12).

Femur I is tabulated (5-6-7, 8). Tarsus IV would be (11-12, 13-14) as would a femur with a movable articulation.

1. *Chthonius johnstoni* J. C. Chamberlin, new species

(Plate 2, fig. 17; Plate 3, figs. 11, 12, 13.)

Female: Chelicerae as long as carapace; fingers longer than hand which is as broad as long; serrula exterior of about 18 teeth; serrula interior of a number of short teeth; flagellum of 8 simple setae (some slightly "frayed" distally); movable finger with five evenly spaced teeth along medial third of length, fixed finger with five teeth which become successively smaller posteriorly; galea entirely absent. Carapace with four pearly white eyes; almost glabrous and obscurely "ornamented" by symmetrical lighter areas; distinctly broader than long and broader

anteriorly than posteriorly, truncate anterior margin produced medially into an acute process or spine (Plate 3, fig. 11). Palpi: fingers very long and slender, twice length of hand and beset with prominent tactile setæ (Plate 2, fig. 17); claw measuring only a little shorter than chelicerae and carapace combined; coxæ "ornamented" similar to carapace. Legs: coxæ of I produced anteriorly into prominent rounded spurs; coxæ of II bearing on their inner margin a pair of remarkable combs of pinnate spines (Plate 3, figs. 12-13), femora of IV stout, less than thrice as long as greatest breadth. Abdomen, tergites entire, bearing six long simple setæ along posterior margin; genital area simple. Length 1.2 mm.

Measurements: Palpus, (11-5.5), (10.5-5.5), (24.5-5), (12-6), (37-11-25, 7). Leg I, (6-4.5), (6-5.7), (14-3, 6-2.8), (7-2), (14.8-1.8). Leg IV, (8.5-6.5), (7-6.5), (23-10-13.8), (14-3.8), (6.5-2.7, 15-2). Carapace, (19-22).

Remarks: This species is easily separable from all described North American forms by the median process of the carapace as well as by numerous other differences. It is not closely related to any species known to me. The characteristic carapacial spine is of rare occurrence in this family. The doubtful genus *Megathis* Stecker was based on this character and on the granulation of the carapace and palpi. With, (1906, p. 74) expresses doubt that these characters are really to be found in the Chthoniidae at all. That both characters are present, however, is certainly true. *Chthonius spinosus* Banks, (1893, p. 67) of which I have examined a specimen, has the palpi and carapace distinctly roughened, in general appearance, however, very different from the characteristic granulation found in the Cheliferidae and Garypidae. It is unquestionably not congeneric with typical *Chthonius*. It does not have the carapacial spine. *C. johnstoni* in spite of this spine, so closely resembles other species of the genus that I can see no reason, at least at present, for removing it to another genus.

This species is named for "El Botanisto", I. M. Johnston, and is dedicated to unforgettable memories of Puerto Escondido.

Habitat: In all probability the only specimen taken, was collected in a moist place under a stone (near spring) at about 1500 feet elevation.

Type: Female, No. 1266, Mus. Calif. Acad. Sci., collected by author, June 14, 1921, in Escondido Gorge, Puerto Escondido, Lower California.

2. *Ideoroncus withi* J. C. Chamberlin, new name

- 1905—*Ideoroncus mexicanus* Bks., With, Ann. Mag. Nat. Hist., Vol. 15, pp. 127-131, Plate IX, figs. 2a-d, Plate X, figs. 1a-f. (Misidentification.)
1906—*Ideoroncus mexicanus* Bks., With, Dan. Exp. Siam., pp. 13, 14, 16, 17, 19, 32, 41, 45, 78, 80 (Misidentification.)

With, in his excellent description of this species in 1905 (pp. 130-131), makes the following statement: "*Remarks.* I have referred the above described species to *Id. mexicanus*, Bks.; the minor points in which this species differs from Banks's description seem not to be sufficient for establishing a new species; but, on the other hand, we must admit that the description mentioned is too insufficient and lacking in important details for settling the question definitely."

Banks's typical specimen was from Sonora, Mexico, and since a species in the Gulf material agrees exactly with Banks's original description, so far as it goes, and since the species as rediscovered differs strikingly in several important respects from the species considered *mexicanus* by With, the latter has been renamed. *I. withi* is from the Windward Islands in the West Indies and the types are presumably in the collections of the British Museum.

A comparison between the two species is made in connection with *mexicanus*.

3. *Ideoroncus mexicanus* Banks

(Plate 2, fig. 13 and Plate 3, figs. 14 and 34.)

- 1898—*Ideoroncus mexicanus* Banks, Proc. Cal. Acad. Sci., Series III, Vol. I, p. 289.

Female: Chelicerae moderate in size; galea a long simple style (Plate 3, fig. 14); flagellum of four setae all of which are distinctly toothed along their anterior margins; serrula exterior attached, except for a very short distance at its tip, with 20 teeth; serrula interior apparently vestigial or absent, fixed finger with five teeth along distal fourth, movable finger with a row of 9 or 10 small evenly spaced teeth. Carapace much longer than broad, two distinct eyes about their diameter from anterior margin which is obtusely angled but without the usual median tooth. Palpi (Plate 2, fig. 13): Claw 3.5 times as long as greatest width, inner margin of hand greatly swollen, fingers 1.5 times as long as hand; finely and evenly granulate. Legs: Femur pars basalis of legs I and II 2.1 times as long as pars tibialis; femoral articulation of legs I and II forming freely movable joint; posterior femoral articulations vertical to long axis of femur and femoral subsegments consequently immov-

able; subterminal setæ trifid (Plate 3 fig. 34). Abdomen: tergites and sternites entire, bordered posteriorly by 8 or 9 very inconspicuous setæ; genital operculum bordered with a row of 6 small, close-set and evenly spaced setæ. Length 2.5 mm.

Measurements: Palpus, (15-10.5), (19.5-13), (45-10), (31-11), (71.5-28-45, 21.). Leg I, (12-9), (10-7), (20.5-4.5, 9.5-5.3), (15.5-3.3), (9-2.7, 13-2). Leg IV, (14-10), (14.5-7.5), (34-15-19, 13), (23.5-5), (12-3, 17-2.4). Carapace, (42-30).

Remarks: As will easily be seen in comparing the description of *mexicanus* with that of *withi*, there are numerous distinctive points of difference between the two species. Most important of these are the three setæ in the flagellum of *withi* as compared with the four of *mexicanus* and the oblique fourth femoral articulation of *withi* as contrasted with the vertical one of *mexicanus*.

Habitat: Under stones in desert arroyos; rare. Described from three specimens.

Neotype: Female, No. 1267, Mus. Calif. Acad. Sci., collected by author at **Las Animas Bay, Lower California, Mexico**. Originally described from a single specimen from San Miguel de Horcasitas, Sonora, Mexico, and the type deposited in the collections of the California Academy of Sciences. It was destroyed in the great fire and earthquake of 1906.

4. *Garypus giganteus* J. C. Chamberlin

1921—Chamberlin, J. C., Can. Ent. Vol. 53, pp. 186-190. Plate VII, figs. A-G.

Female: Claw strongly convex on inner margin, being thrice as long as greatest width. Tarsal joints of first legs subequal in length. Skin very distinctly reticulated having a honeycombed appearance. Tergites longitudinally divided (except last), the halves rather widely separated and comparatively small, the width of half the seventh tergite about subequal to, and not at all longer than, the fourth tarsi. Length 7 mm.

Remarks: This species was not taken on this expedition, but since it belongs to the general region under consideration and also since it is so closely related to *G. sini* n. sp., it is believed that the above short diagnosis will be helpful.

Opportunity is here taken to correct a few errors made in the original description of the species. In fig. A of the animal, the femur pars basalis is much narrower than it should be. It should appear like that of leg III. The coxæ also give an

erroneous impression and allowance should be made for them. The *fixed finger serrula* mentioned in connection with this species (and *G. californicus*) is a synonym of the serrula interior as used in this paper.

Type: Female, No. 748, Mus. Calif. Acad. Sci., collected by U. S. S. Albatross, April 20, 1906, at **Turtle Bay, Lower California**, (one specimen).

5. *Garypus sini* J. C. Chamberlin, new species

(Plate 2, fig. 20)

Female: Claw more strongly convex on inner margin than in *G. giganteus*, being only 2.5 times as long as greatest width (Plate 2, fig. 20). Legs I and II with proximal tarsal segment distinctly longest. Skin not nearly so distinctly reticulated as in *G. giganteus* although the structure is essentially identical in both species. Tergal halves larger and closer together than in *giganteus*, width of half of seventh tergite measuring distinctly longer (by one-fifth length of tarsus) than fourth tarsus. Length 6-7.5 mm.

Measurements: Palpus, (18-12), (16-10.5), (37-11.5), (43-12), (56-25-36, 23). Leg I, (10-12), (9-6), (16-4.6, 9.5-4.9), (14-3), (9-2.5, 7.2). Leg IV, (19-10), (15-7.5), (35-11.5-21.5, 7), (27-3.5), (11-3, 7.7-3). Carapace, (34 and distance between anterior eyes 14.3.) These from a specimen from San Esteban Island.

Male: Smaller than female but structurally practically the same. Genitalia small and comparatively simple. Much rarer than female, in about ratio of one or two to ten. Length 5 mm.

Measurements: Palpus, (14.4-8.2), (11.9-8), (28-8.5), (25-9), (47-21-29.5, 17). Leg I, (8.5-6.4), (7.2-5.9), (13.2-4.2, 8.1-4.2), (11.5-3), (7.2-2.5, 6.8-2.1). Leg IV, (16.1-8.2), (12.3-5.9), (28.9-8.2-20.2, 6.2), (21.6-3.4), (8.9-2.7, 8.3-2.5). Carapace, (27.1 and distance between anterior eyes, 11.5). From holotype.

Remarks: Without doubt this species is very close to *G. giganteus* and for a time it was thought that they were identical. There are, however, a number of well marked differences as may be seen from the above diagnosis. It is not at all improbable, however, that they may be eventually regarded in the light of subspecies, rather than as distinct species.

There is considerable variation in this species as regards size and proportions of the segments of the appendages and it may be possible in a close variational study of the abundant material of this species which is available, to divide it into a number of local races. For example the typical form from

Carmen Island seems to average considerably smaller than specimens from San Esteban Island.

Habitat: Under stones along rocky or sandy beaches. Usually (at least at the time we were there) found in little dome or thimble-shaped nests made of silk and covered with sand grains and small pebbles and attached to the underside of stones, pieces of drift, etc. Often many were found under a single stone. This is one of the commonest and most widespread species found in the Gulf region.

Type: Male, No. 1268, *allotype*, female, No. 1269, Mus. Calif. Acad. Sci., collected by author, May 22, 1921, at Puerto Ballandra, Carmen Island, Gulf of California.

6. *Garypus pallidus* J. C. Chamberlin, new species

(Plate 3, fig. 7)

Male: Chelicerae, small, flagellum of three well developed setae of almost equal length; serrula exterior with 24 teeth, serrula interior obscure; cheliceral setae as in *G. giganteus* (Chamberlin 1921, figs. E and G, p. 187). Carapace, anterior margin distinctly emarginate; anterior eyes about one-fifth length of carapace from its anterior margin. Palpi very slender for this genus, particularly the claw which is 3.5 times as long as greatest breadth. Legs, femora pars basalis of legs I and II about 1.5 times as long as pars tibialis; femora of posterior legs slender; femoral articulation not extremely oblique to long axis. Abdomen very lightly chitinized as is carapace. In a cleared mount the tergites, except for their distal edges, and the carapace, except for anterior and lateral margins and median stripe, are so lightly chitinized as to appear translucent. Length 3 mm.

Measurements: Palpus, (25-17), (21-16), (55.3-14), (52-15), (80.4-38-44, 22). Leg I, (14-10), (12-9), (21-6.5, 13-6.5), (18.5-5), (12.2-3.6, 12.5-3.2). Leg IV, (26-13), (20-10.1), (45-14-30, 9), (34-5.5), (16-5, 14-4.5). Carapace, (47- width between anterior eyes, 19). From holotype.

Female: Very similar to male in most respects, claws of palpi slender than in male measuring about four times as long as greatest breadth (Plate 3, fig. 7). Cribriform plates as is usual, being in this species small, oval in shape, and containing about fifteen circular pores, length 3.3 mm.

Measurements: Palpus, (27-18), (23-17), (60-19), (58-17), (90-41-48, 23). Leg. I, (15-12), (13.5-10), (23-8, 15-8), (21-5.8), (13-4, 13-3.5). Leg IV, (28-15), (23-12), (53-17-36, 10.5), (39-6.5), (17-5.5, 15-4.5). Carapace, (48- distance between anterior eyes, 21). From allotype.

Remarks: This species is easily distinguished from all other Pacific Coast forms by its small size and very pale and characteristically patterned body. Like the other three western American species of this genus it belongs to the

G. floridensis group of With, i. e. those species with three setæ in the flagellum. All these four species are also characterized by a very similar genitalic structure in the males.

Habitat: Same as that of *G. sini* and collected in the same sort of nests. As a matter of fact, at the time I collected them it was thought that they were merely immature individuals of *G. sini* and so, unluckily, but few were taken; "just to establish a record!" Collected nowhere else.

Type: Male, No. 1270, *allotype*, female, No. 1271, Mus. Calif. Acad. Sci., collected by author, June 6, 1921, near Gordas Point, Ceralbo Island, Gulf of California.

7. *Olpium slevini* J. C. Chamberlin, new species

(Plate 2, figs. 15-16; Plate 3, figs. 10 and 16)

Male: Chelicerae, serrula exterior with about 22 teeth; anterior of the three flagellum setæ broader than the posterior two combined. Carapace strikingly narrowed in front of eyes (Plate 3, fig. 10), with two pairs of distinct eyes, the anterior ones twice their diameter from anterior margin of carapace and separated by a distance equal to half their diameter from posterior pair. Palpi (Plate 2, fig. 15), claw strongly swollen on inner margin; fingers remarkably long in comparison to hand; on the fixed finger, removed from its tip by about one-eighth its length, is a curious double row of short, gently swollen setæ (Plate 2, fig. 16), the number of which varies somewhat but averages about eight. Legs, tarsi characteristically spined, distal segment of tarsus IV with six pair of stout acute setæ evenly spaced along its inner margin; the outer margin with several pair of long stout distal setæ and medially with a slender and comparatively short tactile hair; coxæ of characteristic appearance (Plate 3, fig. 16). Abdomen, tergites and sternites bordered by from six to eight small setæ and with numerous lyriform fissures or "stomata"; superficially there appear to be only ten segments owing to the weak chitination of the eleventh segment. Length 3-3.5 mm.

Measurements: Palpus, (20-13), (23-10), (46-12), (43-13.5), (74-28-48, 22.8). Leg I, (12-19), (9.5-7), (20-6, 12-6), (18-4), (11.5-2.8, 9-2). Leg IV, (14.5-12), (15-10), (39-11.5-27, 16), (30-7.5), (15.6-4.2, 12-2.5). Carapace, (42- distance between anterior eyes, 15). From specimen from South Santa Inez Island.

Female: Practically same structurally as male, apparently no distinguishing features in genital area. Claw somewhat stouter than in male, fingers 1.66 times as long as hand, claw thrice as long as greatest breadth. Length about 3.5 mm.

Measurements: Palpus, (21-13), (24-11), (44.5-18.8), (42-14), (75-29-48, 22). Leg I, (13-10), (10-8.1), (20-6, 11-5.8), (17-4), (12-2.5, 9-2). Leg IV, (19-11), (15-9), (40-12-27, 14), (31-6), (16-3.5, 12-2.3). Carapace, (45- distance between anterior eyes, 16). From allotype.

Remarks: This is easily distinguished from all North American species, except *frontalis* Banks, by its large size. From that species it differs by many characters. In *frontalis* the eyes are contiguous and the hand of the palpus is as long as the femur, while in *slevini*, the femur is much longer than hand and the eyes are distinctly separated. Described from numerous specimens.

Named for Joseph R. Slevin, "Jefe" of the expedition, who deserves the greatest of credit for the splendid success of the party.

Habitat: Under stones in desert arroyos, hillsides, etc.; nowhere really common. A fairly agile species.

Type: Male, No. 1272, *allotype*, female, No. 1273, Mus. Calif. Acad. Sci., collected by author, May 20, 1921, at **Cuesta Blanca**, (eight miles north of Loreto), **Lower California**.

Genus MINNIZA Simon

Orthotype, M. VERMIS Simon

This genus which has generally been regarded as a synonym of *Olpium* is here resurrected for the reception of the following two species. Through the kindness of Louis Fage of Paris I have been enabled to examine a specimen of the orthotype and there is no doubt but that these two Mexican species and *vermis* are strictly congeneric. The genotype seems to be rather closely related to *rossi* but may easily be distinguished by its trifid galea.

Chelicerae large, the distance between their posterior corners measuring almost if not quite as much as the breadth of carapace; flagellum of four setae; serrula interior lamina-form; serrula exterior distally fused; carapace almost twice as long as broad, sides subparallel, with four eyes close to anterior margin (Plate 3, fig. 9). Coxae of all legs and also palpi strikingly angular (Plate 3, fig. 17). Femoral articulations of legs I and II forming a movable joint, that of III and IV immovable and oblique to long axis of femur; distal segment of tarsus longest; arolium long, undivided and extending well beyond the simple acute claws.

8. *Minniza rossi* J. C. Chamberlin, new species

(Plate 1, fig. 5; Plate 2, fig. 11; Plate 3, figs. 9 and 17)

Male: Galea basally divided into two branches, serrula exterior with 23 or 24 teeth. Palpi moderately heavy, femur distinctly shorter than carapace, claw 3-3.3 times as long as greatest breadth. Genitalic structures distinctive (Plate 1, fig. 5). Length 2.8 mm.

Measurements: Palpus, (17.5-11), (17-9), (30-8.8), (30-11), (46.5-21-27.5, 17). Leg I, (11-9), (6-5), (12.5-4.8, 7.5-4.5), (12-3), (5.5-2, 6.5-1.3). Leg IV, (11-9), (10-6.5), (27-9-18.5, 11.5), (19.2-5), (9-2.5), 10-2). Carapace, (37.5-21). From holotype.

Female: Much the same as in male, palpi of somewhat different proportions (Plate 2, fig. 11).

Measurements: Palpus, (18-10.5), (18-9), (34-9.4), (33-12), (56-24-34.5, 17.8). Leg I, (12-10), (7-5.5), (14-5, 9-4.8), (15-3.5), (6.8-2, 7-1.8). Leg IV, (13-10), (11-7), (29-9-20, 10), (22-4.5), (11-2.8, 12-2.2). Carapace, (37-23). From allotype.

Remarks: This species is one of the commonest and most widespread of the Gulf forms. Named for Captain John Ross of the Silver Gate, to whom the expedition owes a great deal for its success.

Habitat: Under stones in dry arroyos, barren hillsides and along beaches, sometimes in company with *Garypus sini*, n. sp. This is a very active species. Described from abundant material.

Type: Male, No. 1274, *allotype*, female, No. 1275, Mus. Calif. Acad. Sci., collected by author, April 19, 1921, on San Esteban Island, Gulf of California.

9. *Minniza lindahli* J. C. Chamberlin, new species

(Plate 2, fig. 12)

Female: Serrula exterior with 17 or 18 teeth, galea as in *rossi*. Palpi (Plate 2, fig. 12), much heavier and proportionally shorter than in *rossi*, fingers about the same length as hand, claw very stout, being about 2.3 times as long as greatest breadth.

Measurements: Palpus, (14-8), (13.5-7), (24-8), (26-11), (39-21-20.5, 20). Leg I, (10-8), (5-4), (10-4, 6-4), (11-3), (4-1.5, 7-1.1). Leg IV, (11-8), (7-4.5), (22-7.5-15, 7), (17-3), (5-1.6, 8-1.6). Carapace, (31-19). From holotype.

Remarks: Described from two females. Named for John Lindahl, mate of the "Silver Gate" and entertaining comrade of a three months' cruise.

Habitat: Under stones along rocky beach.

Type: Female No. 1276, Mus. Calif. Acad. Sci., collected by author, April 25, 1921, at **Tepoca Bay, Sonora.**

10. ***Garypinus corticolus*** J. C. Chamberlin, new species

(Plate 1, fig. 2; Plate 2, fig. 1)

Male: Chelicerae with 15 serrula teeth in serrula exterior, anterior seta of flagellum very broad, nearly as broad as posterior three combined and with six or seven serrations along anterior margin, galea short and divided distally into several parts. Carapace, posterior margin of chitization not definite, ragged edged and extending even with anterior margin of coxae IV. Palpi (Plate 2, fig. 1), fingers shorter than hand, claw 3.4 times as long as greatest width, tibia markedly reduced, shorter than hand. Legs, tarsi remarkably short and stubby, shorter than greatest width of femora, the proximal segment but little longer than broad. Coxal area slightly broadest in middle. Abdomen, vermiform, tergites posteriorly bordered by only about four setae, genitalia fairly complex and with a pair of distinct genital sacs (Plate 1, fig. 2). Length 2.5-3 mm.

Measurements: Palpus, (11.5-9), (11-6.5), (22-7.5), (20-9), (35-18-17, 10.3). From paratype from La Paz.

Female: Very similar to male; galea short; basally divided into two branches, one of which is distally forked; claw about thrice as long as wide; genital area distinctly and characteristically chitinated and with two pairs of distinct, oval, cribriform plates. Length 2.5-3 mm.

Measurements: Palpus, (11-8), (12-7), (22-8.6), (20-10.3), (37.5-19-18.5, 12.5). Leg I, (10-10), (4), (14-5-9, 6), (9.5-3.4), (3, 3.8). Leg IV, (12-8), (7-5), (24-9-16, 8.5), (15-5), (3.6-3, 5-3). From paratypes from La Paz and Guaymas.

Remarks: This species is fairly close to *G. serianus*, n. sp., but is easily separated from it by numerous characters, especially in the genital area. In *serianus* the tibiae of the palpi are longer than the hand while in *corticolus* they are very nearly subequal. Described from numerous specimens.

Habitat: Comparatively common under the bark of trees, particularly the little "bark flakes" of the Palo Verdes. I found one feeding on a caterpillar which was also very abundant on Palo Verde.

Type: Male, No. 1277, *allotype*, female, No. 1278, Mus. Calif. Acad. Sci., collected by author, April 12, 1921, at **La Paz, Lower California.**

11. *Garypinus serianus* J. C. Chamberlin, new species

(Plate 1, fig. 1; Plate 2, fig. 2, and text fig. 1)

Male: Chelicerae, serrula exterior with 16 teeth, flagellum slenderer than in preceding species, second seta longest, anterior one with two distal teeth. Carapace with posterior margin of chitinization anterior to posterior margin of coxae II. Palpi (Plate 2, fig. 2), shaped much like that of *corticulus* but more rounded posteriorly, claw 3.3 times as long as wide, fingers shorter than hand. Legs, coxal area of equal width throughout; tarsi much longer than width of femora, comparatively slender, distal segment much the longest. Abdomen somewhat stouter than in *corticulus*; tergites larger and more heavily chitinized than in *corticulus* and bordered posteriorly by about six small setae; genitalia distinctive, with a pair of well marked genital sacs (Plate 1, fig. 1). Length 2.5 mm.

Measurements: Palpus, (13-8), (15-7), (23.8-9), (24-11), (40-21-19, 13). From holotype.

Female: Very similar to male; genital area not so heavily chitinized as in *corticulus*; cribriform plates indistinct. Length 3 mm.

Measurements: Palpus, (13-9), (14-6.8), (24-8.5), (24-10.9), (40-21-19, 12). Leg I, (10-8), (4), (15-5-10, 5.2), (11.5), (3.5, 5). Leg IV, (12-8), (9-6), (25-9-16, 9), (17-5), (5, 7). From allotype.

Remarks: Most closely related to *G. corticulus* n. sp., but also comparatively close to *G. solus* n. sp. Described from ten or twelve specimens.

Habitat: Under stones on hillsides in extremely dry and hot places. One female which is doubtfully referred to this species was taken on the sea beach at Cerralbo Island in company with *Garypus pallidus*, n. sp., and like that species was found in a small silken nidus covered externally with sand grains.

Type: Male, No. 1279, *allotype*, female, No. 1280, Mus. Calif. Acad. Sci., collected by author, July 5, 1921, on Pelican Island, Kino Bay, Gulf of California.

12. *Garypinus solus* J. C. Chamberlin, new species

(Plate 1, fig. 3; Plate 2, fig. 3)

Male: Chelicerae, serrula exterior with 19-20 teeth; flagellum setae subequal in width. Carapace extending almost even with posterior margin of coxae II. Palpi stouter than in the other two species of this group (Plate 2, fig. 3); fingers much shorter than hand; claw 2.6 times as long as greatest breadth; tibia about as long as hand. Legs, coxal area of approximately equal width throughout; tarsi much as in *serianus*. Abdomen not vermiform; tergites very weakly chitinized; genitalia dis-

tinctive, apparently without the paired genital sacs (Plate 1, fig. 3). Length 2.5 mm.

Measurements: Palpus, (14-9), (14-7.5), (25-9.5), (26-13), (44-26.7-17.8, 16). From holotype.

Female: Much the same as male; apparently no distinguishing features about genital area; indistinct cribriform plates present; length 3 mm.

Measurements: Palpus, (11-7), (13-5.8), (20-8), (22-10.5), (36-22-14, 12.5). Leg I, (10-7.5), (4), (14-5-9, 5.5), (10-3), (2.5, 4). Leg IV, (10.5-13), (7.5-5.8), (23-9-13, 9), (15-5.8), (4, 6.2). From allotype.

Remarks: This species, which apparently is fairly close to the preceding two, is very easily distinguished from them by the heavier palpi and short-fingered claw. Described from eight or ten specimens.

Habitat: Under stones on hot dry hillsides. Rare.

Type: Male No. 1281, *allotype*, female, No. 1282, Mus. Calif. Acad. Sci., collected by author, May 13, 1921, on South Santa Inez, Island, Gulf of California.

13. *Garypinus litoralis* J. C. Chamberlin, new species

(Plate 1, fig. 4; Plate 2, fig. 4)

Male: Chelicerae, serrula exterior with 19 teeth; flagellum setae slender, third (?) longest. Carapace evenly and definitely rounded posteriorly reaching as far as anterior margin of coxae III. Palpi comparatively slender (Plate 2, fig. 4); fingers as long as hand; claw thrice as long as width; tibia as long as femur. Legs, tarsi slender, distal segment much the longest; tarsus IV 1.4 times as long as breadth of femur IV. Abdomen, tergites sternites and carapace smooth and "polished", heavily chitinized (the sternites less so) and dark in color; first five tergites completely divided, the next five with an anterior median notch, suggesting a partial division, eleventh entire; tergites bordered posteriorly with about 6 or 7 setae; genitalia very distinct from the three preceding species and very close to those of *G. arboricolus* n. sp. (Plate 1, fig. 4) apparently no genital sacs. Length 2.5 mm.

Measurements: Palpus, (16-11), (16-9), (32-10.3), (32-13), (53-27-27, 18.6). Leg I, (11-10), (6), (19-6-13, 6), (14.8-4), (5, 7). Leg IV, (13-10), (8.8-7), (30-10-20, 11), (22-6.5), (6.5, 9.5). Carapace, (35-distance between anterior eyes, 16). From holotype.

Remarks: This species is discussed below in connection with *G. arboricolus*, n. sp. Described from a single specimen.

Habitat: The only known specimen from under stone on beach.

Type: Male No. 1283, Mus. Calif. Acad. Sci., collected by author, May 25, 1921, at southerly end of Monserrate Island, Gulf of California.

14. *Garypinus arboricolus* J. C. Chamberlin, new species

(Plate 2, fig. 5)

Male: Chelicerae, serrula exterior with 21 teeth; flagellum setae slender, second one the largest. Carapace as in *litoralis*. Palpi stouter than in *litoralis* (Plate 2, fig. 5); claw 2.7 times as long as broad; fingers as long as hand; tibia plainly a little shorter than femur. Legs stouter than in *litoralis*; tarsus IV 1.17 times as long as greatest breadth of femur IV. Abdomen: first eight tergites completely divided; the next two partially so and the eleventh entire; tergites bordered posteriorly with about 6 setae; genitalia very similar to those of *litoralis*, the most striking difference being the presence of a well marked pair of genital sacs in this species although there are other differences. The genital sacs suggest those of *corticulus*. Length 3 mm.

Measurements: Palpus, (20-13), (20-10), (35-13), (33-15.5), (57-30-30, 21). Leg I, (15-13), (6-6), (22-8-14, 8), (15-4.5), (4, 6). Leg IV, (15-11), (12-10), (38-13-25, 15), (24-8.5), (7.5, 10). Carapace, (40-distance between eyes, 17). From holotype.

Female: Much the same as male; fingers of palpi a little shorter than hand; all tergites excepting the eleventh divided; with indistinct cribriform plates. Length 4-4.5 mm.

Measurements: Palpus, (20-12), (20-11), (36-13), (35-16), (59-33-32, 21). From allotype.

Remarks: While the resemblance between this species and *litoralis* is certainly marked, I believe the differences are too great for mere variation. Then, too, there is a difference in habitat to consider. Certainly more material of *litoralis* is desirable. Described from about 17 or 18 specimens.

Habitat: Under bark of trees, acacia, mesquite, etc.

Type: Male, No. 1284, *allotype*, female, No. 1285, Mus. Calif. Acad. Sci., collected by author, April 19, 1921, on San Esteban Island, Gulf of California.

CHELIFERIDÆ Hagen

Flagellum of four or fewer setae. Serrula exterior attached throughout its length. All tarsi single segmented. Femoral articulation of legs III and IV immovable, that of legs I and II usually of only limited movability.

As here considered the Cheliferidæ comprise four subfamilies, namely, the Cheiridiinæ Hansen, the Cheliferinæ Simon, the Sternophorinæ, new subfamily, and the Pseudocheliridiinæ, new subfamily.

PSEUDOCHÉIRIDIINÆ, new subfamily

This subfamily is erected for the reception of the remarkable genus *Pseudochiridium* With (1906, pp. 199-200) from the Orient. The following diagnosis is essentially that given by With for the genus.

Only ten tergites visible from above; the coxæ of the fourth pair of legs much broader than long, being produced into a posterior plate which covers the base of the abdomen together with genital area; the femoral articulation of legs I and II with the "articulate heads" of both anterior and posterior sides in middle; femoral articulation of fourth pair of legs almost perpendicular to longitudinal axis; tarsi distinctly longer than tibia.

The discovery of a species for which a new subfamily is necessary has led to the naming of a new subfamily for *Pseudochiridium* also, as, to have left the latter genus in the Cheliferinæ, would have brought about a most unequal arrangement of the subfamilies and would have produced groups of very unequal rank.

With foresaw that this would be necessary in 1906 (p. 200) when he wrote, "if it in the future will be possible to divide the latter genus (*Chelifer*) into natural genera, it will probably be necessary to establish two new subfamilies, for the genera of the Cheliferinæ Sim. would in other case be of very unequal value." Since this subdivision is already accomplished, in part at least, there is no reason for leaving this genus in the Cheliferinæ.

STERNOPHORINÆ, new subfamily

With an oval, well marked sternum between the coxæ (Plate 3, fig. 15); all femoral articulations (Legs I-IV) perpendicular to long axis of femora and practically immovable; tarsi much shorter than tibiæ (Plate 3, fig. 6). Legs III and IV with a basal tarsal tactile hair; tibiæ with dorsal median tactile hair; chelicerae small; serrula exterior of few teeth, attached throughout its length; flagellum of four setæ; galea present.

Systematically this subfamily seems to come between the Chéiridiinæ and the Pseudochéiridiinæ; the legs resemble in the femoral divisions those of the Pseudochéiridiinæ but differ strikingly in the matter of the tarsi. The entire femora of legs I and II and the tendency towards this condition in legs III and IV in the Chéiridiinæ definitely separate these

two groups. The sternum, which is such a characteristic feature of the new subfamily, strikingly sets it off from either of these two subfamilies. The Cheiridiinæ and the Garypidæ present vestiges of a sternum between the fourth coxæ, at least in some of the species, but nowhere in the Pseudoscorpionida, so far as can be discovered, is there anything which approaches in size and general distinctness the sternum which characterizes this group. In the female the presence of two pairs of very prominent cribriform plates still further distinguishes it from the Cheiridiinæ.

STERNOPHORUS J. C. Chamberlin, new genus

Orthotype *S. sini* J. C. Chamberlin, n. sp.

As this is the only genus at present included in the subfamily the preceding diagnosis of the subfamily applies to the genus as well.

15. *Sternophorus sini* J. C. Chamberlin, new species

(Plate 1, fig. 6; Plate 2, fig. 21; Plate 3, figs. 6, 15, and 22-25)

Male: Chelicerae, galea short and simple; serrula exterior with 12 teeth; anterior flagellum seta broad and toothed on anterior margin, as broad as posterior three setae combined. Carapace, eyeless; obtusely angled behind, weakly chitinized, smooth. Palpi, in shape, particularly that of the claw, remarkably like that of *Garypinus corticolus* n. sp. (The two species were often taken together.) Legs (Plate 3, fig. 6), claws small and simple; empodium small not extending beyond claws; lateral subterminal setae simple. Abdomen, tergites divided longitudinally, each division bordered posteriorly by two or three minute, simple setae; genitalia distinctly different from those of any other Cheliferidae known to me (Plate 1, fig. 6).

Measurements: Palpus, (20-12), (19-12), (29-11), (25-11), (45-24-21.5, 12.3). Leg I, (12-15), (5-5), (15.5-10, 6.2), 10.5-4), (6-2.8). Leg IV, (17-10), (8-7), (25-11-14, 11), (18-6), (10-3.5). From holotype.

Female: Palpi as in male (Plate 2, fig. 21); galea short, with three distal branches; in all respects even in the measurements of the palpal segments scarcely distinguishable from male. Genital area with two pairs of very large and prominent cribriform plates (Plate 3, fig. 22), of which the anterior lateral ones are simple and oval (Plate 3, fig. 25), while the larger median ones are each armed with two large heavily chitinized spines (Plate 3, figs. 23-24).

Habitat: Under bark of Mesquite, Sideroxylon, Palo Tinto, etc., and often in company with other bark dwelling species. Described from numerous specimens.

Type: Male, No. 1286, *allotype*, female, No. 1287, Mus. Calif. Acad. Sci., collected by author, July 4, 1921, near Monument Point, Tiburon Island, Gulf of California.

CHELIFERINÆ Simon

Coxæ of all legs contiguous there being no trace of a sternum; coxæ of legs IV longer than broad; tarsi always shorter than tibiæ; femoral articulations of legs III and IV always at least somewhat oblique, and forming an immovable joint.

CHELIFER Geoffroy

Haplotype, *Chelifer cancroides* Linn.

This genus has formerly been considered as including a large number of species (the majority of the species of the Pseudoscorpionida being placed here) which were placed in a number of so-called subgenera. In this paper all these subgenera are considered as full genera. Two and possibly all of these genera will almost surely be subdivided still further. As the genotypes of several of these genera are insufficiently described it is impossible at present to be sure of the validity of the names as here used.

Chelifer as restricted here is synonymous with Lophochernes Simon, which, as shown by With (1906, p. 117), must be thrown out since it includes *Chelifer cancroides*, the type of the genus Chelifer. With, throughout his papers, refers to this group as the "Lophochernes" group or the group of *Chelifer cancroides*. It may be diagnosed as follows:

Males with ramshorn organs and usually but not always with coxal sacs; fore tarsi almost always curiously modified, mostly with the claws asymmetrical. Female nearly always with well defined genito-lateral setæ rows (Plate 3, fig. 33), and, so far as I can tell always with two pairs of cribriform plates. Both sexes without accessory teeth on fingers of palpi; the flagellum consisting of three setæ; all femoral articulations oblique and the posterior ones immovable; usually two real eyes. Other features which it shares in company with others are two transverse carapacial furrows and longitudinally divided tergites and sternites.

The genus is easily and naturally divided into several groups which, although hardly entitled to subgeneric rank, are at least convenient. The species here considered fall into three

such groups. In addition there is included the *cancroides* group, of which, so far as I know, *cancroides* is the only described species. (See Plate 3, fig. 31). No specimens of this species were taken, nor has it been reported from the region under consideration. The diagnostic characters of these groups are indicated in the following key:

Males

- | | |
|--|---|
| 1. With coxal spur (Plate 3, fig. 18)..... | 2 |
| Without coxal spur (Plate 3, fig. 19).....Group of <i>philipi</i> n. sp. | |
| 2. Fore tarsus with terminal spine (Plate 3, fig. 20)..... | 3 |
| Not so (Plate 3, fig. 21).....Group of <i>cancroides</i> Linn. | |
| 3. Tarsi of legs II, III and IV with bifid claws..... | |
|Group of <i>scabriculus</i> Simon. | |
| Claws simple.....Group of <i>fuscipes</i> Banks | |

Females

- | | |
|---|---|
| 1. Claws bifid..... | 2 |
| Claws simple..... | 3 |
| 2. Chelicerae with <i>setae</i> arrangement of Type I (Plate 3, fig. 32).... | |
|Group of <i>scabriculus</i> Simon | |
| Chelicerae of Type II (Plate 3, fig. 31).....Group of <i>cancroides</i> Linn. | |
| 3. Subterminal setae simple (Plate 3, fig. 21).....Group of <i>philipi</i> n. sp. | |
| Subterminal setae distinctly forked.....Group of <i>fuscipes</i> Banks | |

GROUP of *C. FUSCIPES* Banks16. *Chelifer geronimoensis* J. C. Chamberlin, new species

(Plate 2, fig. 6)

Male: Chelicerae of type I; serrula exterior with 18 teeth. Carapace granulate with larger tubercles. Palpi (Plate 2, fig. 6); fingers much shorter than hand. Legs slender; subterminal setae forked. Abdomen: tergites, with ten strongly developed and prominent tergal spurs. Length 2.1 mm. From holotype.

Measurements: Palpus, (18-14), (22-12), (45-11.5), (40-14), (63-35(?)-29(?), 23).

Remarks: This dark species is related to *fuscipes* but differs in numerous characters. In *fuscipes* the chelicerae are of type II, fingers as long as hand, and there are but 8 weakly developed tergal spurs. Described from a single specimen.

Type: Male, No. 1288, Mus. Calif. Acad. Sci., collected by F. X. Williams, July 13, 1905, on San Geronimo Island, Lower California.

GROUP of *C. philipi* n. sp.17. *Chelifer philipi* J. C. Chamberlin, new species

(Plate 2, fig. 8; Plate 3, figs. 19, 21, 26)

Male: Chelicerae of type I; serrula exterior with 18 teeth. Palpi slender. Legs: all claws simple; posterior of the asymmetrical (unlike) foreclaws with a dorsal spur; subterminal setae simple. Carapace with but few larger tubercles, and these obscure. Abdomen: tergal spurs vestigial or absent; coxal sacs absent. Length 2 mm.

Measurements: Palpus, (16-10), (19-10), (40-9), (39-11), (60-28-33, 14.4). From paratype.

Female: Palpi somewhat slenderer than in male (Plate 2, fig. 8). Genital lateral setae rows ill defined; central cribriform plates large, oval and prominent (Plate 3, fig. 26). Length 2.5 mm.

Measurements: Palpus, (17-12), (20.5-10.5), (44-9.3), (40-9.5), (63-30-34, 15). From paratype.

Remarks: This species is distinct from any others known to me and is easily distinguished from all other American forms. It is named for my brother Philip Chamberlin, companion of many of my early collecting trips. Described from numerous specimens.

Habitat: Under bark of Eucalyptus trees and stumps. Rare.

Types are in my private collection. Male and female paratypes are in the collection of the Calif. Acad. Sci.

Type locality: Stanford University Campus, California.

GROUP of *C. scabriculus* Simon

Includes besides the common *C. scabriculus*, five or six other western American species.

18. *Chelifer hubbardi* Banks

(Plate 2, fig. 10; Plate 3, fig. 33)

1901, Banks. Proc. U. S. Nat. Mus. p. 588, fig. 9.

Male: Chelicerae of type I. Carapace extremely tuberculate being covered with large lumpy tubercles as are also the first two tergites. Palpi: fingers longer than hand; claw about 3.7 times as long as broad. Legs: posterior foreclaw with a dorsal spur. Abdomen: tergites divided longitudinally by a narrow line-like suture. Length 3 mm.

Measurements: Palpus, (24-16), (29-14.8), (75.5-13), (65.5-15), (90.8-46.5-49, 27.8). Specimen from San Josef Island.

Female: Carapace very tuberculate but not so strongly so as in male. Palpi (Plate 2, fig. 10), claw 4.2 times as long as broad. Abdomen:

eighth tergite bordered by about 16 setæ. Genitalia typical (Plate 3, fig. 33). Length 3.2 mm.

Measurements: Palpus, (26-16), (31-17), (85.8-14), (77-15.5), (101-51-53, 23.9). Specimen from San José Island.

Remarks: There seems to be no great variation between Gulf specimens and material from the type locality in Arizona. It seems to be somewhat closely related to *C. lativittatus*, n. sp.

Habitat: In decaying *Cereus*, decaying tubers of *Iber-villia*, etc. Often taken in company with *Chclanops arizonensis* and *Chclifer sini*.

19. *Chelifer lativittatus* J. C. Chamberlin, new species

(Plate 2, fig. 9)

Male: Carapace as in *hubbardi* but with the tuberculations not so prominent; immediately separable from that species by the stouter palpi (Plate 2, fig. 9; claw 3.2 times as long as broad), and still more easily by the extremely broad, lightly chitinized dorsal stripe which occupies about the medial fourth of the abdomen. Tergal spurs very prominent, numbering nine; coxal sacs very large, greatly folded and wrinkled. Length 3 mm.

Measurements: Palpus, (26-18), (33-18), (89-15), (74-17), (110.4-51-55.8, 34). From holotype.

Female: Fingers very little longer than hand; claw less than thrice as long as greatest width; carapace and broad abdominal stripe as in male. Length 3.3 mm.

Measurements: Palpus, (27-19), (31-18), (82.6-15.5), (69-18), (101.7-51-53, 34). From allotype.

Remarks: Apparently most closely related to *Chelifer hubbardi* among North American species. Known only from holotype and allotype.

Type: Male, No. 1289, *allotype*, female, No. 1290, Mus. Calif. Acad. Sci., collected by J. R. Leach, at **Tapachula, Chiapas, Mexico**, at an elevation of from 2000 to 4000 feet.

20. *Chelifer sini* J. C. Chamberlin, new species

(Plate 2, fig. 7; Plate 3, figs. 18, 20 and 32)

Male: Carapace evenly granulate and with scattered larger tubercles. Palpi (Plate 2, fig. 7), claw 2.7-3 times as long as broad. Legs, anterior margin of fourth femora and inner margin of tibia with at least a few larger seta-bearing tubercles. Length, 3.5 mm.

Measurements: Palpus, (24-17), (31-16.5), (68-14.4), (61-17), (92-46-46, 28.5). Specimen from San Josef Island.

Female: Carapace as in male. Palpi, claw 2.8 times as long as broad; fingers distinctly shorter than hand. Length 4 mm.

Measurements: Palpus, (26-18), (32-18), (70-16), (61-19), (93-53-41, 33). Specimen from San Josef Island.

Remarks: This form is very closely related to *C. scabriculus* Simon, but is distinguished therefrom by its larger size, more pronounced tergal spurs in male and other characters of less importance. In all probability it must eventually be regarded as a subspecies of *scabriculus*, but in the absence of intergrading forms I prefer to regard it for the present as distinct. There seems to be some variation in this species, from locality to locality, and very probably it will eventually be possible to divide the species into a number of local races or forms, which will be based largely on quantitative measurements and proportions. Described from many specimens.

Habitat: The type material was taken under the bark of a decaying *Veachia*. In other places it was taken in decaying *Cereus* in company with *Chelifer hubbardi* and *Chelanops arizonensis*. One specimen was taken in a Termite gallery by Mr. E. P. Van Duzee and a few others were taken under bark of trees.

Type: Male No. 1291, *allotype*, female, No. 1292, Mus. Calif. Acad. Sci., collected by author, May 7, 1921, at **Angeles Bay, Lower California**.

Genus WITHIUS Kew

Orthotype, *W. SUBRUBER* (Simon). Cosmopolitan

Femoral articulation of legs I and II practically perpendicular to long axis of femora; fingers of palpi without accessory teeth; real eyes or ocular spots present; tarsal tactile hair never basal in position; claws simple; subterminal setæ never forked; flagellum of four setæ. The male is invariably distinguishable at a glance by the presence of thickly spinose median areas between the longitudinally divided sternites. The longitudinal division of the tergites often obscure. (See With, 1908, pp. 228-230, "Group of *Chelifer subruber*".)

To my knowledge this genus includes two species from North America. One of these is here described as new, the other is *W. lagunæ* (Moles) of southern California (Moles,

1914, pp. 42-44, figs. 1-2), originally described as *Chelanops lagunæ*. It is very closely related to or identical with *W. subruber*, the orthotype, but in the absence of authoritatively named material of the latter species *lagunæ* has not been reduced.

21. *Withius cactorum* J. C. Chamberlin, new species

(Plate 1, fig. 7; Plate 2, fig. 14)

Male: Chelicerae with 18 teeth in serrula exterior. Carapace and tergites very heavily chitinized; two indistinct eyes. Palpi beset with numerous almost clavate setae (Plate 2, fig. 14); the row of 8 or 9 stout setae on the inner margin of femur very characteristic. Abdomen: tergites I to VI undivided, the remaining ones with a narrow median suture; sternites VIII-IX with large median setose areas; sternites III-VII with the superficial appearance of having these areas, but close examination shows them to be destitute of the characteristic setae; genitalia very simple (Plate 1, fig. 7). Length 2 mm.

Measurements: Palpus, (15-9), (15-8), (30.5-8), (26.5-9.5), (39-19-22, 13.5). From holotype.

Remarks: This species is easily distinguished from *lagunæ* by the fingers of the palpi which in *lagunæ* are distinctly shorter than the hand; also by the much simpler male genitalia of *cactorum*, and by numerous other characters. They are not at all closely related. Described from two males.

Habitat: In decaying *Cereus* in company with *Chelanops arizonensis*.

Type: Male, No. 1293, Mus. Calif. Acad. Sci., collected by author, April 18, 1921, on San Pedro Martir Island, Gulf of California.

Genus CHELANOPS Gervais

Haplotype, *C. cæcus* Gerv. Chile

This genus is termed by With in his papers of 1906 and 1908 as the "Group of *Chelifer cimicoides*." The following diagnosis is essentially that given by him:

Femur of legs I with wide oblique articular cavity, with posterior condyles placed near ventral margin; fingers of palps

with accessory teeth; indistinct eyes or ocular spots; tarsal tactile hair at least one-fifth removed from base. The subdivisions are those used by With in 1908.

Trachychernes or Subgroup of *Chelifer bicolor* Balzan. With, 1908, Trans. Zool. Soc. Lond., Vol. 18, p. 261.

22. *Chelanops carminis* J. C. Chamberlin, new species

(Plate 1, fig. 10; Plate 3, figs. 3, 4, 5 and 27)

Female: Palpi moderately stout (Plate 3, figs. 3-4); fingers longer than hand, evenly and finely granulate as is carapace. Legs IV remarkably slender with femoral articulation only slightly oblique (Plate 3, fig. 5); tarsal tactile hair median in position. Genital area simple (Plate 3, fig. 27). Length 3 mm.

Measurements: Palpus, (1-11), (19-9.6), (27(23)-10.8), (27(19.5)-12.5), (50-25-28, 19). From allotype.

Male: Similar to female; genitalia rather distinctive (Plate 1, fig. 10). Length 2 mm.

Measurements: Palpus, (14-10), (17-9), (25.5(22.5)-10.5), (26(19)-11.5), (47-22.5-26, 16). From holotype.

Remarks: This species is easily separable from *arizonensis* by its much smaller size; slender legs; male genitalia and by the arrangement of the sensory spots and setæ of the fingers.

Habitat: Under stones and debris along rocky beach. In company with *Garypus sini*, n. sp. and *Minniza rossi*, n. sp. A female taken from drifted sea weed by Mr. E. P. Van Duzee, at San Luis Island, differs by being considerably larger than the allotype but is identical otherwise.

Type: Male, No. 1294, *allotype*, female, No. 1295, Mus. Calif. Acad. Sci., collected by author, May 22, 1921, at Puerto Ballandra, Carmen Island, Gulf of California.

23. *Chelanops vanduzeei* J. C. Chamberlin, new species

(Plate 2, figs. 22 and 23)

Female: Chelicerae having galea short, stout and divided distally into about five short branches. Carapace suddenly depressed and constricted for its posterior half, giving the animal a peculiar and distinctive appearance; evenly and finely granulate as are the palpi. Palpi extremely heavy (Plate 2, figs. 22-23); very striking is the great *depth* of the claw which

is more than the length of fingers. Accessory teeth small and ranged in evenly spaced rows; arrangement of setæ of fingers rather characteristic (fig. 23). Legs: tarsal tactile hair two-thirds length of tarsus from its base. Abdomen: tergites, excepting eleventh, divided, and, since they are rather broad, the tergal halves appear almost square; tergites bordered by about 12 simple setæ. Length 5 mm.

Measurements: Palpus, (24-18), (26-15.4), (42.5(38.5)-19), (44(29.5)-21-6), (73.5-38-35 to *depth*, 41.5).

Remarks: This species is easily distinguished by the very heavy palpi. The genital area differs from that of the rest of the Gulf species by its simplicity; there is no centralization of the genital setæ such as is usually found in members of this genus. Described from four females.

Habitat: The holotype and one paratype were beaten from *Maytenas* sp. One specimen collected on grass near spring at San Pedro Bay, Sonora. Named for Mr. E. P. Van Duzee who collected the type.

Type: Female, No. 1296, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 18, 1921, on **Coronados Island, Gulf of California.**

24. *Chelanops arizonensis* Banks

(Plate 3, figs. 8 and 30)

1901. Banks. Proc. U. S. Nat. Mus., Vol. 23, p. 589, fig. 2.

The following brief characterization of this common species is given:

Female: Carapace and palpi evenly and finely granulate. Palpi heavy; fingers a little longer than hand; tactile hairs and sensory spots distinctive (Plate 3, fig. 8); claw about 2.4 times as long as width. Legs slender but not so much so as in *carminis*; tactile hair of tarsus IV median in position. Genital area much resembling that of *carminis* (Plate 3, fig. 30). Length 4.5-5 mm.

Measurements: Palpus, (30-26), (36-23), (61(51)-24), (60(47)-26), (104-50-56, width, 42). Specimen from Tortuga Island.

Male: Similar to female; palpi considerably stouter, especially the hand. Genitalia differing considerably from *carminis* although superficially suggesting them. Length 4-4.5 mm.

Measurements: Palpus, (29-24), (35-22), (60(51)-23), (55(42)-26.5), (100-48-57 to depth, 50.5). Specimen from Tortuga Island.

Habitat: In decaying *Cereus*, *Echinocactus* and similar moist places. Often abundant and usually found in the moister parts of the decay. Often taken in company with other species. It was found in company with *Chelifer sini*, *Chelifer hubbardi* and *Withius cactorum*.

Lamprochernes or Subgroup of *Chelifer argentinus* Thor. With, 1908, Trans. Zool. Soc. Lond., Vol. 18, pp. 289-291.

25. *Chelanops ariditatis* J. C. Chamberlin, new species

(Plate 1, fig. 8; Plate 3, figs. 1, 2 and 28)

Female: Carapace almost smooth. Palpi finely granulate; moderately stout (Plate 3, fig. 1); arrangement of tactile hairs and accessory teeth distinctive (Plate 3, fig. 2); fingers shorter than hand. Legs: tarsal tactile hair one-fifth removed from base. Abdomen: tergites lightly chitinized, bearing about 16 setae along posterior border; genital area with curious and distinctive arrangement of setose patches (Plate 3, fig. 28). Length 4 mm.

Measurements: Palpus, (23-17), (24-14), (39(35)-19), (42(30.5)-21.2), (70-38-34, 29). From allotype.

Male: About same as female; genitalia distinctive (Plate 1, fig. 8). Fingers as long as hand. Length 3-3.2 mm.

Measurements: Palpus, (21-15), (20-12.5), (37(33)-19), (38(28)-20.9), (62-32.5-32.5, 28.5). From holotype.

Remarks: This species is most easily recognized in both sexes by the genital area. Described from numerous specimens.

Habitat: Under bark of Mesquite and trees of similar habit. Often in company with other species. Not uncommon.

Type: Male, No. 1297, *allotype*, female, No. 1298, Mus. Calif. Acad. Sci., collected by author, May 8, 1921, at Las Animas Bay, Lower California.

Subgroup of *CHELIFER RUDIS* Balzan (With, III a.)

With, 1908, Proc. Zool. Soc. Lond., Vol. 18, pp. 253, 254.

The following species is doubtfully referred to this subgroup. Certainly it does not belong to any of the other three. The only point in which it seems to agree with *C. rudis* is in the presence of a flagellum consisting of four slender setae. The chances are that it really should be placed in a new group.

26. **Chelanops vastitatis** J. C. Chamberlin, new species

(Plate 1, fig. 9; Plate 2, figs. 18, 19; Plate 3, fig. 29)

Male: Carapace: legs and palpi evenly and finely granulate and beset with stout, almost clavate setæ. Palpi heavy (Plate 2, figs. 18-19); arrangement of tactile hairs and accessory teeth distinctive; hand almost as deep as length of fingers. Legs with tarsal tactile hair 0.65 of tarsal length removed from base. Abdomen, tergite halves narrowly rectangular, being four times as wide as long; tergites bordered posteriorly by about 14 stout serrately clavate setæ; genital area distinctive (Plate 1, fig. 9). Length 3.2 mm.

Measurements: Palpus, (25-21), (26-18), (46(40)-21), (45(33)-23.5), (78-43-41, to *depth*, 40). From holotype.

Female: Similar to male. Palpi not so heavy; shape of hand somewhat different, being broadest near base; claw 2.5 times as long as broad. Genital area distinctive (Plate 3, fig. 29); the anterior margin of the central spinous area varies somewhat in shape. Length 4-4.2 mm.

Measurements: Palpus, (27-25), (28-19), (51(45)-23.3), (51(37.5)-26), (85-47.5-41, to *breadth*, 33.6). From allotype.

Remarks: This species is easily separated from all other Gulf *Chelanops* by numerous characters, such as the genital area, palpi, etc. It is closely related to an unidentified species from Okefinokee Swamp, Georgia.

Habitat: Under bark of Mesquites and trees of similar habit; often in company with other bark dwelling species. Common in places.

Type: Male, No. 1299, *allotype*, female, No. 1300, Mus. Calif. Acad. Sci., collected by author, July 4, 1921, near Monument Point, Tiburon Island, Gulf of California.

LIST OF PAPERS CITED

- 1893—Banks, Can. Ent., Vol. 25; pp. 64-67.
- 1898—Banks, Proc. Calif. Acad. Sci., Series 3, Vol 1, No. 7.
- 1901—Banks, Proc. U. S. Nat. Mus., Vol. 23, p. 589, figs.
- 1921—Chamberlin, J. C., Can. Ent., Vol. 53, pp. 186-191, Pl. VII and text figs.
- 1902—Ellingsen, Mem. Soc. Zool. France, pp. 1-14.
- 1918—Ferris, G. F., "The California Species of Mealy Bugs." <Leland Stanford Junior University Publications, University Series.
- 1914—Moles, M., Journ. Ent. Zool., Pomona Coll., Vol. 6, pp. 42-44, figs. 1-2.
- 1881—Simon, Bull. Soc. Zool., Fr. pp. 1-14.
- 1905—With, Ann. Mag. Nat. Hist., Series 7, Vol. 15, pp 94-143, Pl. VI-X.
- 1906—With, "Chelonethi". Danish Expedition to Siam 1899-1900. <D. Kgl. Danske Vidensk. Selsk. Skrifter, 7 Række, natur. og. math. Afd. III, pp. 1-213. Plates I-IV.
- 1908—With, Trans. Zool. Soc. London, Vol. 18, pp. 217-340, Pl. XXIX-XXXI.

EXPLANATION OF PLATES

Plate I¹

Male genitalia

1. *Garypinus serianus*; 2. *Garypinus corticolus*; 3. *Garypinus solus*; 4. *Garypinus litoralis*; 5. *Minniza rossi*; 6. *Sternophorus sini*; 7. *Withius cactorum*; 8. *Chelanops (Lamprochernes) ariditatis*; 9. *Chelanops (Group IIIa (With) ?) vastitatis*; 10. *Chelanops (Trachychernes) carminis*.

Figures 1 and 10 are "composites" of the holotype and a paratype. Figure 3, is from a paratype from Palm Cañon, Angel de la Guardia Island. All the rest are from the holotypes.

Plate II¹

Palpi

1. *Garypinus corticolus*, ♂ paratype; 2. *Garypinus serianus*, ♂; 3. *Garypinus solus*, ♂; 4. *Garypinus litoralis*, ♂; 5. *Garypinus arboricalus*, ♂; 6. *Chelifer geronimoensis*, ♂; 7. *Chelifer sini*, ♂; 8. *Chelifer philipi*, ♀ paratype; 9. *Chelifer lativittatus*, ♂; 10. *Chelifer hubbardi* (Banks), ♀ paratype (Coll. Mus. Comp. Zool.); 11. *Minniza rossi*, ♀ paratype; 12. *Minniza lindahli*, ♀ paratype; 13. *Idcoroncus mexicanus* (Banks), ♀ neotype; 14. *Withius cactorum*, ♂; 15. *Olpium slevini*, ♂ paratype, Coronados Island; 16. Same, clubbed sensory setæ at tip of movable finger; 17. *Chthonius jahnstoni*, ♀ (Adult ?); 18. 19. *Chelanops (Group IIIa (With)?) vastitatis*, ♂; 20. *Garypus sini*, ♀ paratype, San Esteban Island; 21. *Sternophorus sini*, ♀ paratype, Espiritu Santo Island; 22. 23. *Chelanops (Trachychernes) vanduzeei*, ♀ paratype.

Unless otherwise noted all above figures are from the holotypes. When drawing is from a paratype and no locality given, the paratype is from the type locality.

Plate III¹

1. *Chelanops (Lamprochernes) ariditatis*, ♀ palpus; 2. Same, ♀ paratype, fixed finger; 3. *Chelanops (Trachychernes) carminis*, ♀ paratype, San Luis Island; 4. Same, ♀, fingers; 5. Same, ♀ paratype, San Luis Island, Leg IV; 6. *Sternophorus sini*, ♀ paratype, Espiritu Santo Island, Leg. IV; 7. *Garypus pallidus*, ♀ paratype, palpus; 8. *Chelanops (Trachychernes) arizonensis* (Banks), ♀, fingers of palpus, Tortuga Island; 9.

¹ These plate numbers (I, II, and III) refer only to the plates in this paper.

Minniza rossi, ♀ paratype, anterior margin of carapace; 10. *Olpium slevini*, ♂ paratype, South Santa Inez Island, anterior margin of carapace; 11, 12, 13. *Chthonius johnstoni*, ♀; 11. Anterior margin of carapace; 12. Coxæ I and II; 13. Pinnate coxal spines; 14. *Idoroncus mexicanus* (Banks), ♀ neotype, spinniret; 15. *Sternophorus sini*, ♀ paratype, Espiritu Santo Island, coxæ and sternum; 16. *Olpium slevini*, ♂ paratype, South Santa Inez Island, coxæ; 17. *Minniza rossi*, ♀ paratype, coxæ; 18. Coxa IV of *Chelifer sini*, showing coxal spur and sac, ♂; 19. Coxa IV of *Chelifer philipi*, showing absence of coxal spur and sac, ♂ paratype; 20. Tip of tarsus I of *Chelifer sini*, showing tarsal spine and bifid subterminal setæ, ♂; 21. Tip of tarsus I of *Chelifer philipi*, showing absence of tarsal spine and simple subterminal setæ, ♂ paratype; 22. *Sternophorus sini*, ♀ genital area; 23, 24, 25. *Sternophorus sini*, ♀; 23. Ventral aspect of spined cribriform plate; 24. Lateral aspect of same. 25. Simple (secondary) cribriform plate. ♀; 26. *Chelifer philipi*, ♀ paratype, large or primary pair of cribriform plates; 27. *Chelanops (Trachychernes) carminis*, ♀ paratype, San Luis Island, genital area; 28. *Chelanops (Lamprochernes) ariditatis*, ♀ genital area; 29. *Chelanops (Group IIIa (With)?) vastitatis*, ♀ genital area; 30. *Chelanops (Trachychernes) arizonensis* (Banks) ♀, San Pedro Martir Island, genital area; 31. Chelicerae of Type II, showing reduction in the number of dorsal setæ. (*Chelifer cancrroides* (Linn.) ♀, Salt Lake City, Utah); 32. Chelicerae of Type I, showing normal number of dorsal setæ. (*Chelifer sini*, ♂); 33. *Chelifer hubbardi* (Banks), ♀ genital area, paratype. (Coll. Mus. Comp. Zool.); 34. *Idoroncus mexicanus* (Banks) ♀ neotype. Subterminal seta.

Figures drawn from the holotype are indicated by the male sex sign, ♂. Figures from the allotype are indicated by the female sex sign, ♀. Figures from paratypes from type locality are listed without localities.

PLATE I

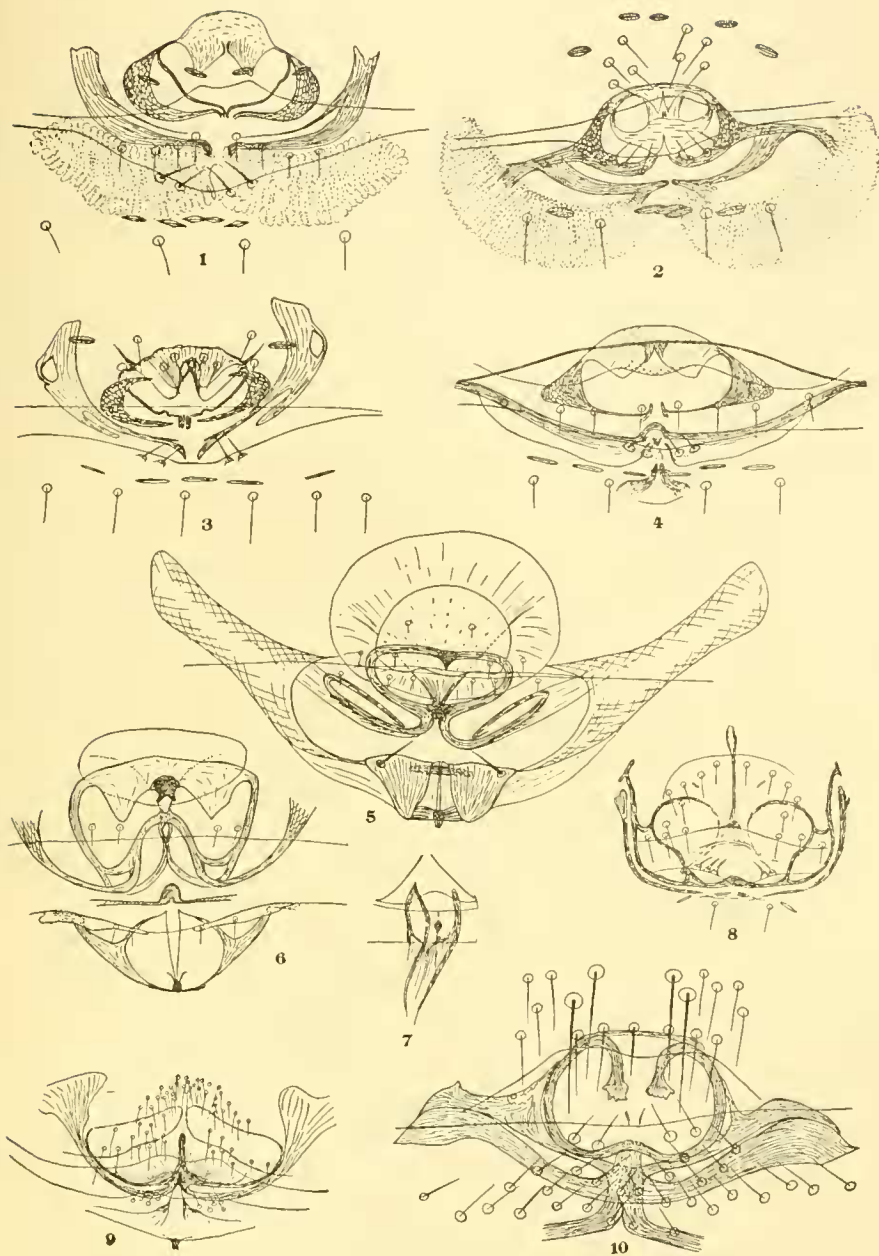


PLATE II

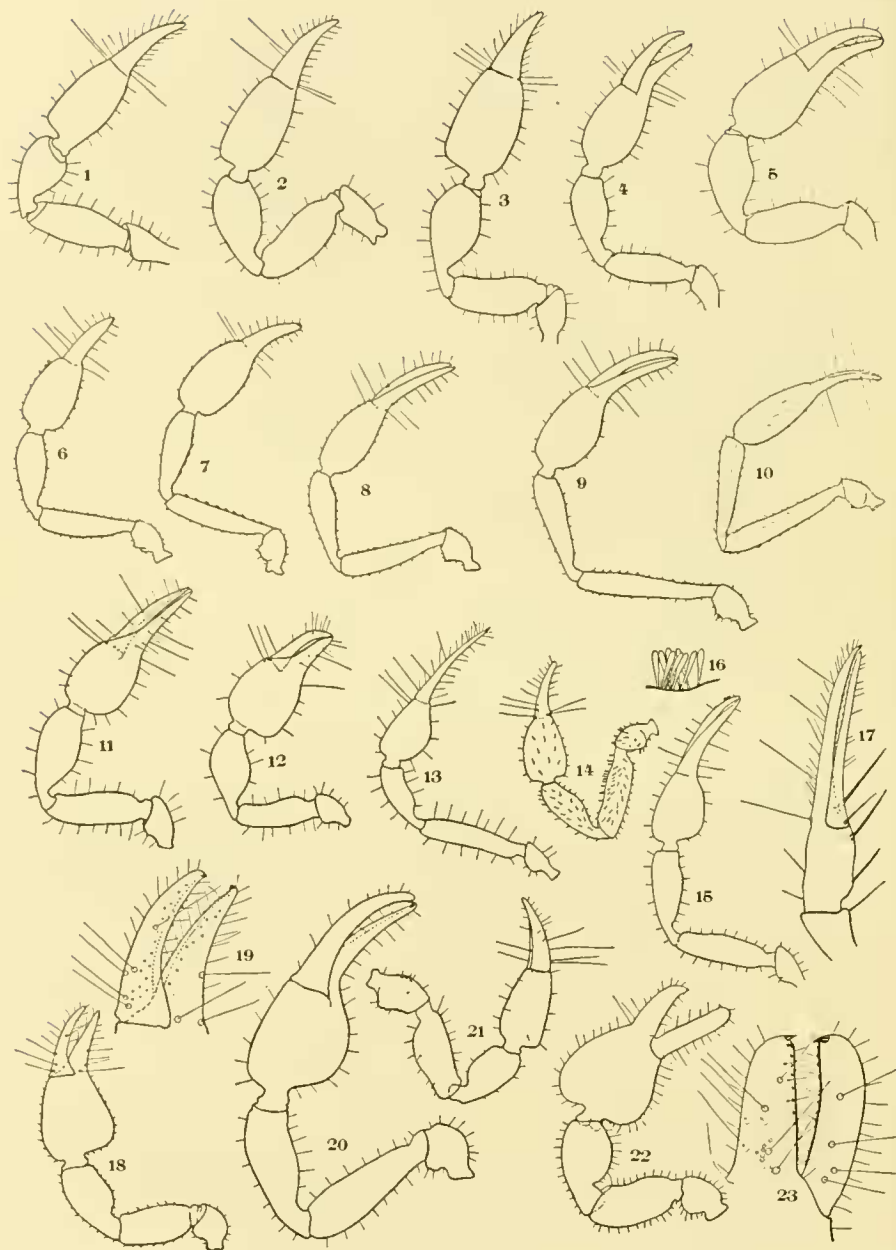


PLATE III

